

CLIMATE DYNAMICS, PHD

Banner Code: SC-PHD-CLIM

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The mission of this program is to train the next generation of scientists in climate dynamics and related fields. Through a comprehensive grounding in coursework, our students learn about how the atmosphere, ocean, and land surface work together to determine the climate. In collaboration with internationally-known scientists, students conduct independent work to further our understanding of climate, how it varies, and how much of it we can predict. Tools in the program include cutting-edge climate models, superb computing facilities, sophisticated statistical techniques, and comprehensive data sets. Our graduates have gone on to work at top laboratories and universities.

Understanding climate variability and predictability poses difficult mathematical, computational, and observational questions that have generated increasing intellectual excitement in recent years. Climate variability has important ramifications for society, from planning for next year's electrical demand and forecasting agricultural production to answering complex questions involving long-term change in global climate, sea level, and biodiversity. While it is impossible to predict day-to-day weather more than a few weeks in advance, progress in predicting El Niño supports the idea that seasonal averages of temperature, rainfall, and other factors may be at least partly predictable months or even years in advance. Likewise, there is a strong scientific basis for predicting long-term changes in global climate due to changing greenhouse gas concentrations.

Climate dynamics faculty members have a blend of expertise in dynamics, statistics, and computational methods. They are heavily involved with national and international collaborations. Faculty members and students work closely with scientists at the Center for Ocean-Land-Atmosphere Studies (COLA) (<http://cola.gmu.edu/cola.html>), a national leader in climate modeling.

Faculty research focuses on the areas of climate prediction and predictability, climate variability, coupled ocean-atmosphere-land dynamics, and dynamical systems and retrospective analysis. Recent research topics include predictability of weather and climate; modeling of the complex climate system; El Niño dynamics; monsoons; atmosphere-ocean interaction; land-climate interaction; decadal climate variability; ocean circulation theory; and climate change.

This has been designated a Green Leaf program.

Admissions & Policies

Admissions

University-wide admissions policies can be found in the Graduate Admissions Policies section of this catalog.

To apply for this program, please complete the George Mason University Admissions Application (<https://www2.gmu.edu/admissions-aid/apply-now>).

Applicants should have demonstrated a high aptitude for quantitative reasoning, applied mathematics, and physical science. Applicants should have an undergraduate degree from a regionally accredited institution with a GPA of at least 3.00 in undergraduate work, and a GRE verbal plus quantitative score of 301 (1,100 on the old scale). To apply, prospective students should submit a completed George Mason University Admissions Application (<https://www2.gmu.edu/admissions-aid/apply-now>), a current résumé, three letters of recommendation, an expanded goals statement, and two copies of official transcripts from each college and graduate institution attended. An official report of scores obtained on the GRE-GEN should also be officially reported by ETS (<https://www.ets.org>). The GRE requirement for admission to the doctoral programs can be waived if the student holds a master's degree from a regionally accredited U.S. institution. TOEFL scores are required of all international applicants who have not completed a master's degree in the United States.

Policies

For policies governing all graduate programs, see AP.6 Graduate Policies.

Reduction of Credit

For students entering the doctoral program with a master's degree in a related field from a regionally accredited institution, the number of required credits may be reduced up to 30 credits, subject to approval of the program faculty and the college's associate dean for student affairs. See AP.6.5.2 Reduction of Credits for more information.

Requirements

Degree Requirements

Total credits: 72

This is a Green Leaf program.

Students should refer to the Admissions & Policies tab for specific policies related to this program.

Fundamental Climate Science Courses

Code	Title	Credits
CLIM 710	Introduction to Physical Climate System	3
CLIM 711	Introduction to Atmospheric Dynamics	3
CLIM 712	Physical and Dynamical Oceanography	3
CLIM 714	Land-Climate Interactions	3

CLIM 751	Predictability and Prediction of Weather and Climate	3
Total Credits		15

Core Computational Courses

Code	Title	Credits
CSI 690	Numerical Methods	3
CLIM 715	Numerical Methods for Climate Modeling	3
CLIM 762	Statistical Methods in Climate Research	3
Total Credits		9

Climate Seminar

Code	Title	Credits
Climate Seminar		3
CLIM 991	Climate Dynamics Seminar (taken three times)	
Total Credits		3

Electives

Code	Title	Credits
Select 21 credits of graduate-level electives, including CLIM courses and other relevant courses as approved by the graduate coordinator. ¹		21
CLIM courses		
Total Credits		21

¹ Including up to 3 credits of CLIM 796 or CLIM 996.

Qualifying Exams

After completing the fundamental climate science courses, students take a two-part qualifying exam that includes core and specialty components. The core component is administered by an examination committee. After successfully completing the core component exam, students take the exam for the specialty component, which is administered by the dissertation committee that students typically form by the spring semester of their second year.

Advancement to Candidacy

Following successful completion of both parts of the qualifying exam, students present a written dissertation proposal to the committee. Students may enroll in CLIM 998 Doctoral Dissertation Proposal to complete this effort. After approval of the dissertation proposal and completion of all non-dissertation program requirements, students are formally advanced to doctoral candidacy.

Dissertation Research and Defense

After approval of the dissertation proposal, students are formally advanced to doctoral candidacy and produce the dissertation while taking CLIM 999 Doctoral Dissertation. The degree's requirements will be fulfilled upon completion of the required coursework and approval of a dissertation that makes an original and significant contribution to the field.

No more than 24 combined credits from CLIM 998 Doctoral Dissertation Proposal and CLIM 999 Doctoral Dissertation may be applied toward satisfying doctoral degree requirements, with no more than 21 credits of CLIM 998 Doctoral Dissertation Proposal.

Code	Title	Credits
Dissertation Research		24
CLIM 998	Doctoral Dissertation Proposal	
CLIM 999	Doctoral Dissertation (minimum 3 credits)	
Total Credits		24